CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

1. – 30. (Canceled).

31.   (New) A system, comprising:

a memory comprising:

a plurality of data items and a plurality of directory information items, each data item uniquely associated with one of the plurality of directory information items;

wherein each of the plurality of data items is configured in accordance with one of a plurality of access modes;

wherein each of the plurality of directory information items comprises indicia of the access mode of its associated data item;

a multiplexer coupled to the memory and comprising a multiplex ratio;

a plurality of buffers coupled to the multiplexer and to the memory;

wherein the multiplex ratio is a function of the number of buffers in the plurality of buffers; and

a plurality of multiplexer/demultiplexers (MDMs), each MDM uniquely coupled to a different one of the plurality of buffers;

a plurality of processing elements coupled to the memory, wherein each of the processing

elements uniquely couples in a point-to-point connection to a different one of the

plurality of MDMs;

wherein each of the processing elements is configured to transmit a data request to its

associated MDM, the data request identifying one of the plurality of data items and

an access mode;

wherein the memory is configured to transmit a data response to each of the processing

elements in response to a data request, the data response comprising the identified

data item and its associated directory information; and

wherein each of the processing elements is further configured:

to receive the data response and to compare the associated directory information

with the access mode of the data request; and

in the event that the associated directory information and the access mode of the data

request are not compatible, to initiate coherence actions for the requested

data item.

32.   (New) The system of Claim 21, wherein the memory further comprises coherence logic
configured to initiate coherence actions in response to a request from a processing unit.

33.   (New) The system of Claim 32, wherein the coherence actions are performed by the
memory.

34.   (New) The system of Claim 31, wherein the coherence actions are performed on a bus separate from the point-to-point connections between the processing elements and the MDMs.

35.   (New) The system of Claim 31, wherein the coherence actions are performed by processing elements associated with the access mode of the data item.

36.   (New) The system of Claim 31, wherein each of the plurality of directory information items further comprises indicia of the access mode of a subset of its associated data item

37.   (New) The system of Claim 31, wherein the each of the plurality of directory information items further comprises one-hot encoding indicating an exclusive access mode associated with one of the plurality of processing elements.

38.   (New) The system of Claim 31, wherein the directory information comprises a plurality of bits, one half of the bits indicating a shared state and the remaining one half of the bits indicating an exclusive state, with each of the plurality of bits associated with one of the plurality of processing elements.

39.   (New) The system of Claim 31, wherein the memory further couples to a visualizer.

40.   (New) The system of Claim 31, wherein the memory further couples to a main memory.

41.   (New) A method for cache coherency, comprising:

storing, by a memory, a plurality of data items and a plurality of directory information items, each data item uniquely associated with one of the plurality of directory information items;

wherein each of the plurality of data items is configured in accordance with one of a plurality of access modes; and

wherein each of the plurality of directory information items comprises indicia of the access mode of its associated data item;

storing, in a local cache by a processing element comprising the local cache, a subset of the plurality of data items and associated directory information items;

determining, by the processing element, whether a requested data item resides in the local cache of the processing element;

in the event the requested data item does not reside in the local cache of the processing element, transmitting, through a point-to-point connection to a dedicated buffer of the memory, a data request to the memory;

wherein the data request identifies the requested data item and a requested access mode;

determining, by the memory, whether the requested data item resides in the memory;

in the event the requested data item resides in the memory, transmitting to the processing element a data response, wherein the data response comprises the requested data item and its associated directory information, independent of whether the associated directory information indicates an access mode compatible with the requested access mode;

receiving, by the processing element, the requested data item and its associated directory information;

determining, by the processing element, whether the received associated directory information indicates an access mode compatible with the requested access mode; and

in the event the received associated directory information does not indicate an access mode compatible with the requested access mode, initiating, by the processing element, coherency actions for the requested data item.

42.   (New) The method of Claim 41, wherein each of the plurality of directory information items further comprises indicia of the access mode of a subset of its associated data item

43.   (New) The method of Claim 41, wherein the each of the plurality of directory information items further comprises one-hot encoding indicating an exclusive access mode associated with one of the plurality of processing elements.

44.   (New) The method of Claim 41, wherein the directory information comprises a plurality of bits, one half of the bits indicating a shared state and the remaining one half of the bits indicating an exclusive state, with each of the plurality of bits associated with one of the plurality of processing elements.

45.   (New) The method of Claim 41, further comprising:

in the event the received associated directory information does indicate an access mode compatible with the requested access mode, storing, by the processing element, the requested data item and its associated directory information in the local cache.

46.   (New) A computer program product comprising a tangible computer-readable medium having computer program code for cache coherency, the computer program product comprising:

computer program code for storing, by a memory, a plurality of data items and a plurality of directory information items, each data item uniquely associated with one of the plurality of directory information items;

wherein each of the plurality of data items is configured in accordance with one of a plurality of access modes; and

wherein each of the plurality of directory information items comprises indicia of the access mode of its associated data item;

computer program code for storing, in a local cache by a processing element comprising the local cache, a subset of the plurality of data items and associated directory information items;

computer program code for determining, by the processing element, whether a requested data item resides in the local cache of the processing element;

computer program code for, in the event the requested data item does not reside in the local cache of the processing element, transmitting, through a point-to-point connection to a dedicated buffer of the memory, a data request to the memory;

wherein the data request identifies the requested data item and a requested access mode;

computer program code for determining, by the memory, whether the requested data item resides in the memory;

computer program code for, in the event the requested data item resides in the memory, transmitting to the processing element a data response, wherein the data response comprises the requested data item and its associated directory information, independent of whether the associated directory information indicates an access mode compatible with the requested access mode;

computer program code for receiving, by the processing element, the requested data item and its associated directory information;

computer program code for determining, by the processing element, whether the received associated directory information indicates an access mode compatible with the requested access mode; and

computer program code for, in the event the received associated directory information does not indicate an access mode compatible with the requested access mode, initiating, by the processing element, coherency actions for the requested data item.

47.   (New) The computer program product of Claim 46, wherein each of the plurality of directory information items further comprises indicia of the access mode of a subset of its associated data item

48.   (New) The computer program product of Claim 46, wherein the each of the plurality of directory information items further comprises one-hot encoding indicating an exclusive access mode associated with one of the plurality of processing elements.

49.   (New) The computer program product of Claim 46, wherein the directory information comprises a plurality of bits, one half of the bits indicating a shared state and the remaining one half of the bits indicating an exclusive state, with each of the plurality of bits associated with one of the plurality of processing elements.

50.   (New) The computer program product of Claim 46, further comprising:

computer program code for, in the event the received associated directory information does indicate an access mode compatible with the requested access mode, storing, by the processing element, the requested data item and its associated directory information in the local cache.